Technology Innovation News Survey

Entries for July 1-15, 2014

Market/Commercialization Information

ENVIRONMENTAL MULTIPLE AWARD CONTRACT FOR REMEDIATION OF VARIOUS RADIOLOGICAL CONTAMINANTS AT VARIOUS NAVY AND MARINE CORPS INSTALLATIONS IN THE NAVFAC SW AND NAVFAC LANT AOR

Naval Facilities Engineering Command, NAVFAC Southwest, San Diego, CA.
Federal Business Opportunities, FBO-4639, Solicitation N6247314RSS27, 2014

NAVFAC Southwest is conducting a sources-sought to identify firms capable of providing all services necessary for remediation of radiological contaminants primarily (but not exclusively) within the state of California. Prime contractors must possess a Nuclear Regulatory Commission Broad Scope License and California Agreement State License Broad Scope Radioactive Material License. Materials may include by-product, source, and special nuclear materials; naturally occurring radioactive materials (NORM); accelerator-product radioactive materials; and technically enhanced NORM (TENORM). Other hazardous contaminants may include those regulated under RCRA, CERCLA, TSCA, and SWDA as well as petroleum, oils, and lubricants. The estimated task order range is $500,000-$10M, with an estimated aggregate value of ~$240M for all contracts awarded. Each of the proposed contracts will be for a one-year base period and four one-year option periods. Submittals must be received before 2:00 PM PDT, August 28, 2014. https://www.fbo.gov/spg/DON/NAVFAC/N68711A6A/N6247314RSS27/listing.html

HAZARDOUS TOXIC AND RADIOLOGICAL WASTE (HTRW) ARCHITECT ENGINEER IDIQ CONTRACTS

U.S. Army Corps of Engineers, USACE District, New England, Concord, MA.
Federal Business Opportunities, FBO-4640, Solicitation W912WJ-14-X-0023, 2014

The USACE New England District is conducting a sources-sought for indefinite-delivery, indefinite-quantity hazardous, toxic, and radiological waste architect/engineer contracts to determine the interest, availability, and capability of all types of small business concerns under NAICS code 541330, size standard $15M. The intent is to award 4 to 7 contracts with a total contract value between $30M to $40M. The work to be performed under these contracts is mainly in the six New England States (ME, NH, VT, MA, CT, and RI) but can include all other states and districts covered by the USACE North Atlantic Division's mission areas (NY, PA, NJ, DE, MD, VA, WV, and the District of Columbia). Typical projects involve the investigation and assessment of site contaminants and the determination of effective remedial designs to address site risks to human health and the environment. Work would begin early in 2016 for a period not to exceed five years. Responses are due no later than September 5, 2014. https://www.fbo.gov/spg/USA/COE/DACA33/W912WJ-14-X-0023/listing.html

POTENTIALLY RESPONSIBLE PARTY (PRP) INVESTIGATION ARGENTINE MINING DISTRICT

U.S. Forest Service, Region 2, Fort Collins, CO.
Federal Business Opportunities, FBO-4638, Solicitation AG-82AT-S-14-0034, 2014

The U.S. Forest Service has a requirement for PRP investigation services within the Argentine Mining District for the Boulder Ranger District Office, Boulder, Colorado. This is a total small business set-aside. Issuance of the solicitation at FBO.gov is expected on or around August 19, 2014, with a likely due date of August 29, 2014.
https://www.fbo.gov/spg/USDA/FS/R2FtCollins/AG-82AT-S-14-0034/listing.html

ENVIRONMENTAL MULTIPLE AWARD CONTRACT (EMAC) FOR ENVIRONMENTAL SERVICES AND IMPLEMENTATION OF REMEDIAL ACTIONS, NAVFAC MID-ATLANTIC (MIDWEST)

Naval Facilities Engineering Command Mid-Atlantic, Norfolk, VA.
Federal Business Opportunities, FBO-4634, Solicitation N4008514R5235, 2014

The nationwide NAVFAC EMAC will be posted on the Navy Electronic Commerce Online website at https://www.neco.navy.mil/ on or about August 15, 2014, with proposals likely due 30 days thereafter. The preponderance of the work is at the Naval Station Great Lakes, IL; Naval Surface Warfare Center Crane, IN; and Naval Support Activity Millington, TN, but other locations within the NAVFAC AOR may be included to meet workload. This procurement is 100% set-aside for competitive, service-disabled, veteran-owned small U.S. business firms, NAICS code 562910, size standard of 500 employees. The Government's objective is to obtain environmental services entailing a wide range of projects:

- Environmental actions (e.g., removal actions, expedited cleanup).
- Environmental services supporting remedial activities (e.g., operating and optimizing remedial systems performance; pilot and treatability studies; long-term monitoring).
- General environmental services (e.g., site characterization, soil-groundwater cleanup).
- Environmental programmatic support (e.g., audits, Administrative Record preparation).

The solicitation will result in up to five multiple-award contracts with a 12-month base year and potentially four option years. The estimated maximum value for all contracts is $45M.
https://www.fbo.gov/spg/DON/NAVFAC/N62470HR/N4008514R5235/listing.html

ENVIRONMENTAL SAMPLING

Department of the Air Force, Air Force Reserve Command, 94 CONF/LGC, Dobbins ARB, GA.
Federal Business Opportunities, FBO-4641, Solicitation FA6703-14-T-0007, 2014

Dobbins Air Reserve Base, Marietta, Georgia, has issued a combined synopsis/solicitation for environmental sampling services as 100% set-aside for small businesses, NAICS code 541380, with a size standard of $14M. Sampling will be conducted for stormwater outfalls (9 outfalls per quarter, 36 each); hazardous waste characterization (analysis and a waste profile for each characterization performed, 15 each); lead-based paint sampling and analysis (10 each); and asbestos sampling and analysis (10 each). The contract performance period is one base year with one 12-month option period. A performance work statement is posted with the notice at FBO.gov. The closing date for responses is September 9, 2014, 2:00 PM ET.
https://www.fbo.gov/spg/USAF/AFRC/94LGLGC/FA6703-14-T-0007/listing.html

Cleanup News

AN INJECTABLE APATITE PERMEABLE REACTIVE BARRIER FOR IN SITU 90SR IMMOBILIZATION

Vermeul, V.R., J.E. Szecsody, B.G. Fritz, M.D. Williams, R.C. Moore, and J.S. Fruchter.
Groundwater Monitoring & Remediation, Vol 34 No 2, 28-41, 2014

An injectable permeable reactive barrier (PRB) technology was developed at DOE's Hanford facility to sequester Sr-90 in groundwater through the in situ formation of calcium-phosphate mineral phases, specifically apatite, which incorporates Sr-90 into the chemical structure. The development approach included bench-scale experiments, an initial pilot-scale field test, and in 2008 the emplacement of a 300-ft PRB at treatability-test scale. The apatite amendment formulation uses two separate precursor solutions, one containing a Ca-citrate complex and the other a Na-phosphate solution, to form apatite precipitate in situ. Citrate is needed to keep calcium in solution long enough to achieve a more uniform and areally extensive distribution of precipitate formation. The 300-ft PRB was installed on the downgradient edge of a Sr-90 plume beneath the Hanford site to reduce Sr-90 flux discharging to the Columbia River. Monitoring data collected to date indicate that the barrier is meeting treatment objectives (i.e., 90% reduction in Sr-90 concentration) and continues to meet remedial objectives more than four years after installation. *See additional details in report DOE/RL-2013-22*: http://www.hanford.gov/c.cfm/sgrp/GWRep12/html/gw12_6_100NR.pdf.

AN "APATITE" FOR RADIONUCLIDES: PERMEABLE REACTIVE BARRIERS MAY BE DEPLOYED AT FUKUSHIMA

Holinka, S.
Sandia Lab News, Vol 66 No 15, p 5, 25 July 2014

A technology developed at Sandia National Laboratory to protect groundwater at sites contaminated with radionuclides is being evaluated for use at the Fukushima site in Japan to prevent radioactive strontium from reaching the ocean. Under a program funded by TEPCO (Tokyo Electric Power Co.), the Sandia, Pacific Northwest, and Savannah River national laboratories will provide recommendations for permeable reactive barrier design, installation, and monitoring at the Fukushima site in an effort to control groundwater contaminant migration. The same technology, a calcium apatite-based permeable barrier, has been in use at DOE's Hanford site for eight years to sequester mobile strontium-90 that threatens the Columbia River.
See the third article at http://www.sandia.gov/news/publications/LabNews/archive/14-25-07.html.
See also the 2014 TEPCO report, "Control Measures for Water Leaked from the H4 Area Tank: A Field Test for Collecting Strontium Present in Soil":
http://www.tepco.co.jp/en/decommission/planaction/images/140130_01.pdf.

Demonstrations / Feasibility Studies

DIRECT PUSH HIGH-PRESSURE JET INJECTION METHOD FOR DELIVERY OF IN SITU REMEDIATION AGENTS IN CLAY TILL

Durant, N. and C. Ross.
Vintermode om Jord-Og Grundvandsforurening, Vingsted, 11-12 March 2014, 57 slides, 2014

Presented are the results of three pilot studies using jet injection, a novel 10,000 psi hydraulic method intended to create large fractures in low-permeability soils. A pilot test was completed using jet injection to deliver zero-valent iron from two wells into clay till in Taastrup, Denmark. After the first pilot test, specialized injection tooling was developed to improve performance by combining jet injection with direct push (DP) drilling techniques. This DP jet injection tooling was used during two additional pilot tests in saprolite in South Carolina and in clay till in Ohio. The resulting fracture network for each pilot test was excavated and mapped. In Taastrup, the injection achieved an ROI of 6 to 7 m, but the loss of kinetic energy caused by the tooling design resulted in short circuiting into natural vertical fractures. In the second test using improved DP tooling in saprolite, injection of water and dye resulted in a maximum ROI of 2.1 m. In the third test, injection of water, dye, and guar gel slurry created subhorizontal fractures in clay till with cylindrical conduits up to 1.4 m long and an ROI of up to 3 m. Pilot results showed greater ROI than conventional fracturing methods, the potential to bypass natural fractures, and feasibility of implementation with DP drilling techniques.
http://www.atv-jord-grundvand.dk/Afholdte_moeder/Vintermoede2014/Spor%202%20-%20modul%201%20-%20In%20situ%20afvaerge/Chapman%20Ross.%20Geosyntec.pdf

REAL-TIME KEROSENE AND DIESEL FUEL FOOTPRINT DIFFERENTIATION USING LIF-UVOST™ WAVEFORM SIGNATURE ANALYSIS

Bartz, C., M. Wolf, B. Harding, S. Muller, and L. VanderKam.
Presentation Summaries from RAILTEC: The 15th Railroad Environmental Conference, 5-6 November 2013, University of Illinois at Urbana-Champaign.

The Laser-Induced Fluorescence Ultraviolet Optical Screening Tool (LIF-UVOST™) was used to differentiate and delineate two different middle-distillate fuel contaminant footprints at a railyard. The LNAPL plumes are parallel and commingle at some locations. The diesel plume was previously known, and diesel recovery had been monitored for over 10 years. A separate plume, determined to be kerosene, was discovered more recently. The transverse extent of the both LNAPL plumes was determined in LIF-UVOST™ transects, and fluorescence indicated two distinct waveform signatures, suggesting that the plumes were from different sources. Multiple lines of evidence, including GC-MS fingerprinting, confirmed that both diesel fuel and kerosene were present as two plumes at the railyard. While LIF-UVOST™ technology offers real-time identification of products based on waveform characteristics, caution should be exercised in confirming product types based solely on LIF-UVOST™ responses because commingling of products, varying product formulations, weathering, and soil matrix interference can challenge LIF data interpretation. More information on this technology can be found in the 153-slide training presentation to the Montana DEQ, "Laser Induced Fluorescence: Theory and Data Interpretation," at http://deq.mt.gov/LUST/Presentations/Dakota%20Technologies%20LIF%20Training%20-%20March%202014%20.pdf.

ELECTRO-CHEMICAL ARSENIC REMEDIATION: FIELD TRIALS IN WEST BENGAL

Amrose, S.E., S.R.S. Bandaru, C. Delaire, C.M. van Genuchten, A. Dutta, A. DebSarkar, C. Orr, J. Roy, A. Das, and A.J. Gadgil.
Science of the Total Environment, Vols 488-489, 539-546, 2014

This paper presents field trial results of a 600-L electrochemical arsenic remediation (ECAR) reactor operating for 3.5 months in West Bengal. Results are evaluated through the lens of a community-scale micro-utility business model as a potential sustainable and scalable safe water solution for rural communities in South Asia. The system consistently reduced arsenic concentrations of ~266 µg/L to under realistic conditions. http://gadgillab.berkeley.edu/wp-content/uploads/2014/05/STOTEN-Manuscript-pdf.pdf

PERFORMANCE OF LARGE-SCALE ALGAL CULTIVATION FOR URBAN WATER QUALITY RESTORATION IN THE GREAT LAKES

Blersch, D.M.
Program and Abstracts of the American Ecological Engineering Society 14th Annual Meeting, 9-11 June 2014, Charleston, South Carolina. p 22, 2014

Two pilot-scale benthic algal cultivator raceways were installed near the mouth of the Buffalo River in Buffalo, New York, and operated from April to November of 2013. Water was pumped continuously from the river and passed over a cultivated bed of benthic algae in the raceway. Algal biomass samples were analyzed weekly for total productivity; inlet-outlet water quality; and ash, nutrient, and metals content. Recoverable biomass composition averaged 75.6% ash, 11.6% carbon, 1.3% nitrogen, and 0.14% phosphorus, plus measurable quantities of heavy metals. In addition, increases in dissolved oxygen and pH were measured between the inlet and outlet. An economic model of large-scale algal cultivation for restoration of urban aquatic systems developed using these results suggests that the cost per unit recovery for any one elemental contaminant is high, but the combination of multiple remediation and restoration benefits from a single process mitigates the cost. *Additional information*: https://enst.umd.edu/news/bright-green-future-algal-turf-scrubber

Research

METHOD FOR ASSESSING SOURCE ZONE NATURAL DEPLETION AT CHLORINATED ALIPHATIC SPILL SITES

Ekre, R., P.C. Johnson, B.E. Rittmann, and R. Krajmalnik-Brown.
Groundwater Monitoring & Remediation, Vol 34 No 2, 60-70, 2014

The approach proposed in this paper for site-specific assessment of source zone natural attenuation (SZNA) at chlorinated aliphatic hydrocarbon (CAH)-impacted sites is similar in some ways but different in other ways from recently proposed SZNA assessment paradigms for petroleum-impacted sites. Petroleum-impacted site SZNA approaches emphasize quantifying fluxes of electron acceptors, while the proposed CAH assessment approach emphasizes quantifying parent and daughter compound fluxes. A paradigm for assessing SZNA at CAH sites is presented and illustrated using the example of a former dry cleaner site, where the PCE SZNA rate was ~3.5 kg/year, with about 80% of the mass loss attributed to groundwater flow and 20% attributed to vapor transport. *See R. Ekre's Ph.D. dissertation for more information on this work* — http://repository.asu.edu/attachments/110486/content/Ekre_asu_0010E_12890.pdf — *as well as the final report for ESTCP project ER-200705* —http://www.estcp.com/content/download/27662/274807/file/ER-200705-FR.pdf.

INTERACTION OF OXIDANTS IN SIDERITE CATALYZED HYDROGEN PEROXIDE AND PERSULFATE SYSTEM USING TRICHLOROETHYLENE AS A TARGET CONTAMINANT

Yan, N., F. Liu, and W. Huang.
Chemical Engineering Journal, Vol 219, 149-154, 2013

A siderite-catalyzed H_2O_2 and persulfate process was studied to investigate the interaction mechanism of this system with TCE as a target contaminant. The degradation of TCE in siderite-catalyzed H_2O_2 and persulfate systems with different H_2O_2 and persulfate concentrations was in accordance with first-order kinetics reactions. The siderite-catalyzed H_2O_2 system removed 49.3% of TCE in 30 h, whereas the siderite-catalyzed H_2O_2 and persulfate system removed 100% of TCE in 24 h. Increasing the H2O2 or persulfate dosage (thereby increasing hydroxyl radicals or sulfate radicals generation) can yield a higher TCE removal efficiency. The faster oxidant decomposition rate in the system using siderite-catalyzed H_2O_2 alone suggests that the addition of persulfate slows H_2O_2 decomposition, which reduces the loss of hydroxyl radicals and enhances TCE removal efficiency.
http://www.cugb.edu.cn/upload/20600/papers_upload/259.pdf

ACCOUNTING FOR MASS TRANSFER KINETICS WHEN MODELING THE IMPACT OF LOW PERMEABILITY LAYERS IN A GROUNDWATER SOURCE ZONE ON DISSOLVED CONTAMINANT FATE AND TRANSPORT

Bell, James M., Master's thesis, Air Force Institute of Technology, Wright-Patterson Air Force Base, OH. AFIT-ENV-14-M-08, 65 pp, 2014

In the subsurface, DNAPLs can pool atop low permeability layers, and despite efforts to remove or destroy the majority of pooled DNAPL, a fraction of the mass can move by diffusion into the low permeability layer and then by back-diffusion act as a secondary contamination source for decades. Recent studies have found evidence that cracks can exist in low permeability layers within aquifers. In this work, the DNAPL dissolution rate was modeled both as a constant and as a function of time. Models were applied using parameters and conditions applicable to a real-world site. In the case of the time-varying rate of mass transfer from the DNAPL to the dissolved phase (because the rate decreases with time), more DNAPL mass persisted in the low permeability zone compared to when the rate is modeled as constant, resulting in more persistent dissolved plumes in the high permeability zones, with higher dissolved concentrations. Downgradient dissolved contaminant concentrations and mass of DNAPL stored in the low permeability zone as a function of time were very dependent on the parameters used to simulate source dissolution, which further depend on both source and site characteristics, underscoring the need for good source zone characterization. http://www.dtic.mil/cgi-bin/GetTRDoc?AD=ADA598465

LONG-TERM POTENTIAL OF IN SITU CHEMICAL REDUCTION FOR TREATMENT OF POLYCHLORINATED BIPHENYLS IN SOILS

Olson, M.R., J. Blotevogel, T. Borch, M.A. Petersen, R.A. Royer, and T. Sale.
Chemosphere, Vol 114, 144-149, 2014

A possible explanation for the limited treatment achieved for PCBs in soil-water systems is that reactants capable of degrading PCBs in the aqueous phase are unlikely to persist long enough to achieve meaningful treatment of slowly-desorbing PCBs associated with the soil phase. To investigate this theory, lab studies tested chemical reductants—zero-valent metals, palladium (Pd) catalyst, and emulsified zero-valent iron (EZVI)—for PCB dechlorination in the presence and absence of soil. In the absence of soil, Pd-catalyzed treatments (Pd with electrolytic ZVI or iron/aluminum alloy) achieved rapid destruction of model PCB congener 2-chlorobiphenyl, with half-lives ranging from 43 to 110 min. In soil containing Aroclor 1248 at an initial concentration of ~1,500 mg/kg, Pd-catalyzed treatments achieved no measurable enhancement over the control PCB depletion rate of 5.3 mg/kg/week. In the presence of soil, only EZVI enhanced PCB dechlorination rates, achieving PCB concentration reductions of >50% at an average rate of 19 mg/kg/week. Results suggest that slow PCB desorption is what limits its treatment effectiveness in soil.

UW RESEARCH: BACTERIA SHOW PROMISE IN RESTORING AQUIFERS USED IN URANIUM MINING

University of Wyoming News, June 2014

Research in University of Wyoming labs has shown that stimulating growth of native bacteria could be an effective way to remediate aquifers tapped by in situ leach uranium mining, the technique used in the vast majority of Wyoming's existing and planned uranium operations. If the lab findings are confirmed in the field, uranium companies could save significantly in groundwater restoration costs while achieving better results. The researchers have determined that the most effective substance to stimulate the bacteria at the Smith Ranch-Highland study site is tryptone, a partially degraded milk protein commonly used in laboratories. A second project, nearing completion, simulated actual field conditions, tested different feeding rates, and developed monitoring criteria. The interdisciplinary team of scientists plans to begin a field trial with tryptone at Smith Ranch-Highland in June 2014. The study is expected to take 10 months to a year. http://county10.com/2014/06/12/uw-research-bacteria-show-promise-restoring-aquifers-used-uranium-mining/

WIDESPREAD DISTRIBUTION OF SOLUBLE DI-IRON MONOOXYGENASE (SDIMO) GENES IN ARCTIC GROUNDWATER IMPACTED BY 1,4-DIOXANE

Li, M., J. Mathieu, Y. Yang, S. Fiorenza, Y. Deng, Z. He, J. Zhou, and P.J.J. Alvarez.
Environmental Science & Technology, Vol 47 No 17, 9950-9958, 2013

Soluble di-iron monooxygenases (SDIMOs), especially group-5 SDIMOs (i.e., tetrahydrofuran and propane monooxygenases), are of significant interest due to their potential role in the initiation of 1,4-dioxane (dioxane) degradation. Rice University researchers have found that naturally occurring bacteria able to degrade dioxane are more common than once thought. The researchers are creating forensic tools to measure the amount of dioxane-consuming microbes in contaminated groundwater. http://alvarez.blogs.rice.edu/files/2014/01/168.pdf

PULL ARSENIC FROM DRINKING WATER AND CONVERT TO BRICKS

Rutkin, A.
New Scientist, Vol 221 No 2962, p 21, 28 Mar 2014

A team at the University of California, Berkeley, has developed a way to filter arsenic from drinking water and lock it up in concrete used for construction, where it remains unavailable to people and the environment. Using the Electrochemical Arsenic Remediation (ECAR) technology, water is placed in a container fitted with steel plates. A small voltage is fed through the plates to encourage rusting. Arsenic binds to the rust, which can be easily collected and integrated into concrete.
http://www.newscientist.com/article/mg22129624.500-pull-arsenic-from-drinking-water-and-convert-to-bricks.html#.U-zDyaOMSbI An Indian company, Luminous Water Technologies, has licensed the invention: http://newscenter.lbl.gov/2014/03/05/indian-company-licenses-berkeley-lab-invention-for-arsenic-free-water/.

DISTRIBUTION OF HEAVY-METAL CONTAMINATION IN REGULATED RIVER-CHANNEL DEPOSITS: A MAGNETIC SUSCEPTIBILITY AND GRAIN-SIZE APPROACH, RIVER MORAVA, CZECH REPUBLIC

Famera, M., O. Babek, T.M. Grygar, and T. Novakova.
Water, Air & Soil Pollution, Vol 224 No 5, 2013

To provide better insight into the spatio-temporal distribution of heavy metals in river channel deposits, researchers investigated levels of Cu, Pb, and Zn in a series of sediment cores along the River Morava, with particular attention to the relationships between metal concentrations, sediment lithology (facies), grain size, magnetic susceptibility, and the mineralogy and chemistry of fly-ash particles. The investigators found that river-channel deposits were significantly more contaminated than their floodplain counterparts, with much of the contamination found in coarse-grained, sandy facies. Elevated enrichment factors of Zn, Cu, and Pb in several sediment layers and their chemistry suggest that a significant fraction of heavy-metal contamination can be carried by magnetic fly-ash spherules. A part of this contamination is bound to coarse-grained fluvial facies, indicating that the magnetic spherules can be transported as bed load sediments. Magnetic pollution and heavy-metal pollution therefore can coincide in river bed deposits. *See* ***PDF pages 144-161*** *for the text of this paper in M. Famera's Ph.D. dissertation at* http://is.muni.cz/th/230010/prif_d/Disertacni_prace_Famera.pdf.

MAGNETIC NANOPARTICLES: ESSENTIAL FACTORS FOR SUSTAINABLE ENVIRONMENTAL APPLICATIONS

Tang, S.C.N. and I.M.C. Lo.
Water Research, Vol 47, 2613-2632, 2013

This review aims to provide a holistic overview of current knowledge of magnetic nanoparticles in environmental applications, with an emphasis on studies of nanoscale zero-valent iron, magnetite, and maghemite particles. The authors discuss contaminant removal mechanisms, factors affecting contaminant desorption, challenges and factors influencing magnetic nanoparticle recovery, particle aggregation, methods for enhancing stability, and toxicological effects.
http://www.nanoshel.com/wp-content/uploads/Downloads/reserchpapper/The%20Hong%20Kong%20University%20of%20Science%20and%20Technology.pdf

DEFLUORINATION OF AQUEOUS PERFLUOROOCTANESULFONATE BY ACTIVATED PERSULFATE OXIDATION

Yang, S., J. Cheng, J. Sun, Y. Hu, and X. Liang.
PLOS One, Vol 8 No 10, Oct 2013

A study of activated persulfate oxidation technologies for defluorination of aqueous perfluorooctanesulfonate (PFOS) evaluated the influences of catalytic method, time, pH, and potassium persulfate ($K_2S_2O_8$) amounts. LC/MS/MS was used to detect the intermediate products during PFOS defluorination. Results showed that $K_2S_2O_8$ had only a weak effect, whereas sulfate radicals oxidatively defluorinated PFOS in water. The defluorination efficiency of the PFOS treatments had the following order: hydrothermal/ $K_2S_2O_8$ > ultraviolet/ $K_2S_2O_8$ > Fe2+/ $K_2S_2O_8$ > ultrasound/ $K_2S_2O_8$. Low pH was favorable for PFOS defluorination with sulfate radicals. Sulfate radicals oxidation and hydrolysis were the main mechanisms involved in defluorination of PFOS.
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0074877

SENSITIVE COLORIMETRIC VISUALIZATION OF PERFLUORINATED COMPOUNDS USING POLY(ETHYLENE GLYCOL) AND PERFLUORINATED THIOLS MODIFIED GOLD NANOPARTICLES

Niu, H., S. Wang, Z. Zhou, Y. Ma, X. Ma, and Y. Cai.
Analytical Chemistry, Vol 86 No 9, 4170-4177, 2014

Researchers developed a novel sensing strategy employing mixed poly(ethylene glycol)-terminated (PEG-thiols) and perfluoroalkyl-terminated (F-thiols) alkanethiols modified gold nanoparticles (Au@PEG-F NPs) as a probe to detect perfluorinated compounds (PFCs) in water samples. The adsorbed PFCs cause the aggregation of Au@PEG-F NPs probes and thus induce the insolubility of probes and precipitation directly from reaction solution due to the superhydrophobicity of perfluorocarbon monolayers, leading to color and absorbance response of the assay to PFCs. The preparation of the Au@PEG-F NPs probe is very simple, and the colorimetric assay based on this mechanism for the detection of PFCs is selective and convenient. Combined with UV-vis spectrophotometry, the assay demonstrates good sensitivities to PFCs with wide linear range. In the designed concentration range, the response of the colorimetric assay to long-chain PFCs (perfluoroalkyl chain ≥7) is discerned even when the PFC concentration is as low as 10 μg/L.

CHELANT SOIL-WASHING TECHNOLOGY FOR METAL-CONTAMINATED SOIL

Voglar, D. and D. Lestan.
Environmental Technology, Vol 35 No 11, 1389-1400, 2014

The feasibility of an EDTA-based washing technology for metal-contaminated soil was evaluated in a pilot-scale experiment. Acid precipitation coupled to initial alkaline toxic metal removal and an electrochemical advanced oxidation process were used for average recovery of 76±2% of EDTA per batch and total recycle of water in a closed process loop. No wastewater was generated, and solid wastes were bitumen-stabilized before disposal. Using conventional process equipment—e.g., a mixer for soil extraction, screen for soil/gravel separation, filter chamber presses for soil/liquid and recycled EDTA separation and soil rinsing, continuous centrifuge separator for removal of precipitated metals, and electrolytic cells for process water cleansing—the treatment removed up to 72% Pb, 25% Zn, and 66% Cd from garden soil contaminated with up to 6,960, 3,797, and 32.6 mg/kg of Pb, Zn, and Cd, respectively, in nine 60-kg soil batches. Concentrations of Pb and Zn in the remediated soil declined by 97% and 96%, respectively, and fell below the level of determination for Cd.

ANALYSIS OF THE PHYLOGENETIC AND FUNCTIONAL DYNAMICS OF MICROBIAL COMMUNITIES IN METALLIFEROUS, ACID-GENERATING MINE TAILINGS SUBJECT TO A PHYTOSTABILIZATION TREATMENT

Valentin-Vargas, Alexis, Ph.D. dissertation, University of Arizona, 243 pp, 2013

This study was divided into two main projects: (1) monitoring the temporal variations in functional and taxonomic diversity of prokaryotic populations in acid-generating metalliferous mine tailings during phytostabilization to determine how they respond to or influence changes in environmental parameters and to identify key patterns in their composition that might serve as bioindicators of soil health and remediation performance, and (2) evaluating how the dynamic behavior of the bacterial, fungal, and archaeal communities correspond to the growth of plants, the addition of soil amendments, and fluctuations in environmental conditions. Results indicate that different microbial groups respond differently to changes in environmental conditions during phytostabilization, suggesting that remediation effectiveness can be assessed by monitoring the behavior of specific microbial groups in the systems as bioindicators.
http://arizona.openrepository.com/arizona/bitstream/10150/307007/1/azu_etd_13022_sip1_m.pdf

General News

DETERMINATION OF POLYCHLORINATED BIPHENYLS (PCBS) IN SEDIMENT AND BIOTA

Webster, L., P. Roose, P. Bersuder, M. Kotterman, M. Haarich, and K. Vorkamp.
ICES Techniques in Marine Environmental Sciences, No. 53, 23 pp, 2013

The determination of PCBs in sediment and biota generally involves extraction with organic solvents, cleanup, and gas chromatographic separation with electron capture detection or mass spectrometry. Due to the low concentrations of non-ortho-substituted PCBs compared to those of other PCBs, their determination may require an additional separation step. All stages of the procedure are susceptible to insufficient recovery and/or contamination; therefore, quality control procedures are important to check method performance.
http://ices.dk/sites/pub/Publication%20Reports/Techniques%20in%20Marine%20Environmental%20Sciences%20(TIMES)/times53/PCBs%20TIMES%2053%20for%20print.pdf

SURVEY OF BROMINATED FLAME RETARDANTS

Lassen, C., A.A. Jensen, M. Crookes, F. Christensen, C.N. Jeppesen, A.J. Clausen, and S.H. Mikkelsen. Danish Environmental Protection Agency, Copenhagen, Denmark. 288 pp, 2013

This survey contains collected information on the use and occurrence of brominated flame retardants internationally and particularly in Denmark, as well as information on environmental and health effects, alternatives to the brominated substances, monitoring and exposure, and ongoing research. The primary focus is on three example compounds: decabromdiphenyl ether (decaBDE); additive use of tetrabromobisphenol A (TBBPA); and hexabromocyclododecane (HBCDD). The main objective of this study is to provide background for the Danish EPA's consideration regarding the need for further risk management measures of certain brominated flame retardants that either persist or degrade to environmentally persistent bioaccumulative or toxic compounds.http://prodstoragehoeringspo.blob.core.windows.net/56f59e7c-82d5-4086-86f1-39e1e1f2a831/LOUS%202013%20Hoering%20Brominated%20flame%20retardants.pdf

THE VALUE OF BROWNFIELD REMEDIATION

Haninger, K., L. Ma, and C. Timmins.
National Bureau of Economic Research, NBER Working Paper 20296, 59 pp, 2014

U.S. EPA's Brownfields program awards grants to redevelop contaminated properties known as brownfields. This paper estimates cleanup benefits based on a nationally representative sample of brownfields using a variety of quasi-experimental techniques. The authors combined non-public EPA administrative records with high-resolution, high-frequency housing data to estimate the effects of brownfield cleanup across the entire federal Brownfields program. The data show that increases in property values accompany cleanup, ranging from 4.9% to 11.1%. A double-difference matching estimator finds even larger effects of up to 32.2%, leading to the conclusion that Brownfields program cleanups yield a positive, statistically significant, but highly localized effect on housing prices. NBER requires payment for the paper on its website (http://www.nber.org/papers/w20296); however, a free, earlier version of this work by the same authors is available athttp://sites.nicholasinstitute.duke.edu/environmentaleconomics/files/2013/01/WP-EE-12-08.pdf.

The Technology Innovation News Survey welcomes your comments and suggestions, as well as information about errors for correction. Please contact Michael Adam of the U.S. EPA Office of Superfund Remediation and Technology Innovation at adam.michael@epa.gov or (703) 603-9915 with any comments, suggestions, or corrections.

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